

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1 (withdrawn): A method for providing connection between a flip chip and a substrate, comprising

- providing a chip having a set of bumps formed on a bump side thereof;
- providing a substrate having a set of interconnect points on a metallization thereon;
- providing a measured quantity of a polymer adhesive in a middle region of the chip on the bump side;
- aligning the chip with the substrate so that the set of bumps aligns with the set of interconnect points;
- pressing the chip and the substrate toward one another so that a portion of the polymer adhesive contacts the substrate and the bumps contact the interconnect points; and
- heating the bumps to a temperature sufficiently high to form a metallurgical connection at an interface between the bumps and the interconnect points.

Claim 2 (withdrawn): The method of claim 1 wherein the bumps are stud bumps.

Claim 3 (withdrawn): The method of claim 1 wherein the bumps comprise gold.

Claim 4 (withdrawn): The method of claim 1 wherein the bumps are plated with a metal comprising gold.

Claim 5 (withdrawn): The method of claim 1 wherein the interconnect points comprise tin.

Claim 6 (withdrawn): The method of claim 5 wherein the interconnect points comprise pure tin.

Claim 7 (withdrawn): The method of claim 1 wherein the interconnect points comprise a metal plated with a metal comprising gold.

Claim 8 (withdrawn): The method of claim 1 wherein the bumps are stud bumps comprising Au and the interconnect points comprise Sn, and the heating step raises the temperature of the bumps sufficiently to create an alloy between the Au and the Sn in a bonding phase at the interface.

Claim 9 (withdrawn): The method of claim 8 wherein the heating step raises the temperature of the bumps sufficiently to create an alloy comprising a 80:20 Au:Sn between in a bonding phase at the interface.

Claim 10 (withdrawn): The method of claim 1 wherein the heating step raises the die to a temperature greater than about 200 °C.

Claim 11 (withdrawn): The method of claim 1 wherein the heating step raises the die to a temperature about 232 °C.

Claim 12 (withdrawn): The method of claim 1, further comprising underfilling with a polymer.

Claim 13 (withdrawn): A chip package structure made according to the method of claim 12.

Claim 14 (previously presented): A chip package structure comprising
a chip having a bumps formed thereon and a substrate having interconnect points on a metallization thereon, the bumps forming contacts with the interconnect points, wherein each said contact comprises an interconnection layer situated at an interface between the bump and the interconnect point in contact therewith, the layer comprising an alloy of the material of the bump and the material of the interconnect point.

Claim 15 (original): The chip package structure of claim 14 wherein a cured adhesive polymer is situated in a middle region between the bump surface of the chip and the surface of the substrate.

Claim 16 (original): The chip package structure of claim 14 wherein the bump material comprises gold and the interconnect points comprise Sn, and the alloy at the interface comprises a Au/Sn alloy.

Claim 17 (currently amended): The chip package structure of claim 16 wherein the alloy at the interface ~~[[is]]~~ comprises a 20:80 Sn:Au alloy.

Claim 18 (previously presented): A chip package structure comprising
a chip having bumps formed thereon and a substrate having interconnect points on a metallization thereon, the bumps forming contacts with the interconnect points, wherein each said contact comprises an alloy of the material of the bump and the material of the interconnect point, the alloy being limited to a layer situated at an interface between the bump and the interconnect point, and
a first cured adhesive polymer forming a spot situated in a middle region between the bump surface of the chip and the surface of the substrate, there being no first cured adhesive polymer at the contacts.

Claim 19 (previously presented): The chip package structure of claim 18 wherein the bump material comprises gold and the interconnect points comprise Sn, and the alloy at the interface comprises a Au/Sn alloy.

Claim 20 (currently amended): The chip package structure of claim 19 wherein the alloy at the interface ~~[[is]]~~ comprises a 20:80 Sn:Au alloy.

Claim 21 (previously presented): The chip package structure of claim 18, further comprising a second cured adhesive polymer forming an underfill.